Air Toxics 101

Science of Environmental Justice Conference

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What are Toxic Air Pollutants?

- Pollutants known or expected to cause cancer or other serious health and/or environmental effects
- Also called hazardous air pollutants (HAPs) or simply Air Toxics
- Air Toxics Lists
  - CAA identifies 188 pollutants
  - Urban Air Toxics List or “Dirty 33”
  - Mobile Source Air Toxics (MSAT)
  - Indoor Air Toxics
  - Persistent Bioaccumlative Toxics (PBTs)

"Air Toxics" are not all alike

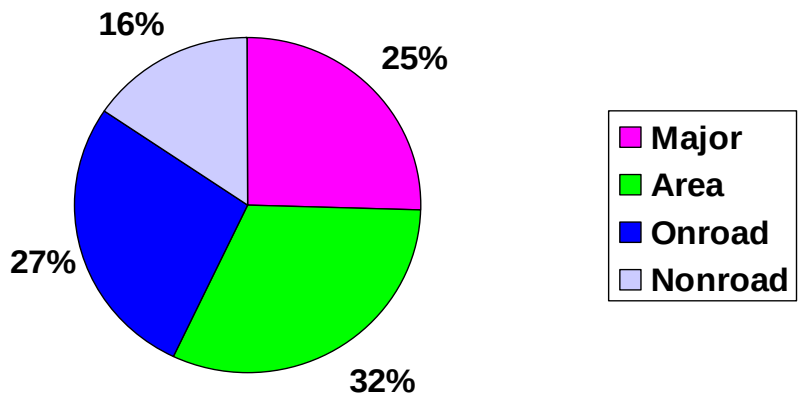
- Air Toxics can be
  - Gases or particles
  - Reactive (or Volatile), semivolative, or non-reactive
  - Short lived or persistent in the atmosphere
- Examples
  - Volatile: VOCs like Formaldehyde, Benze
  - Semivolatile: PAHs
  - Particles: metals like lead and arsenic
  - Persistent Toxics: mercury and dioxin

Sources of Air Toxics

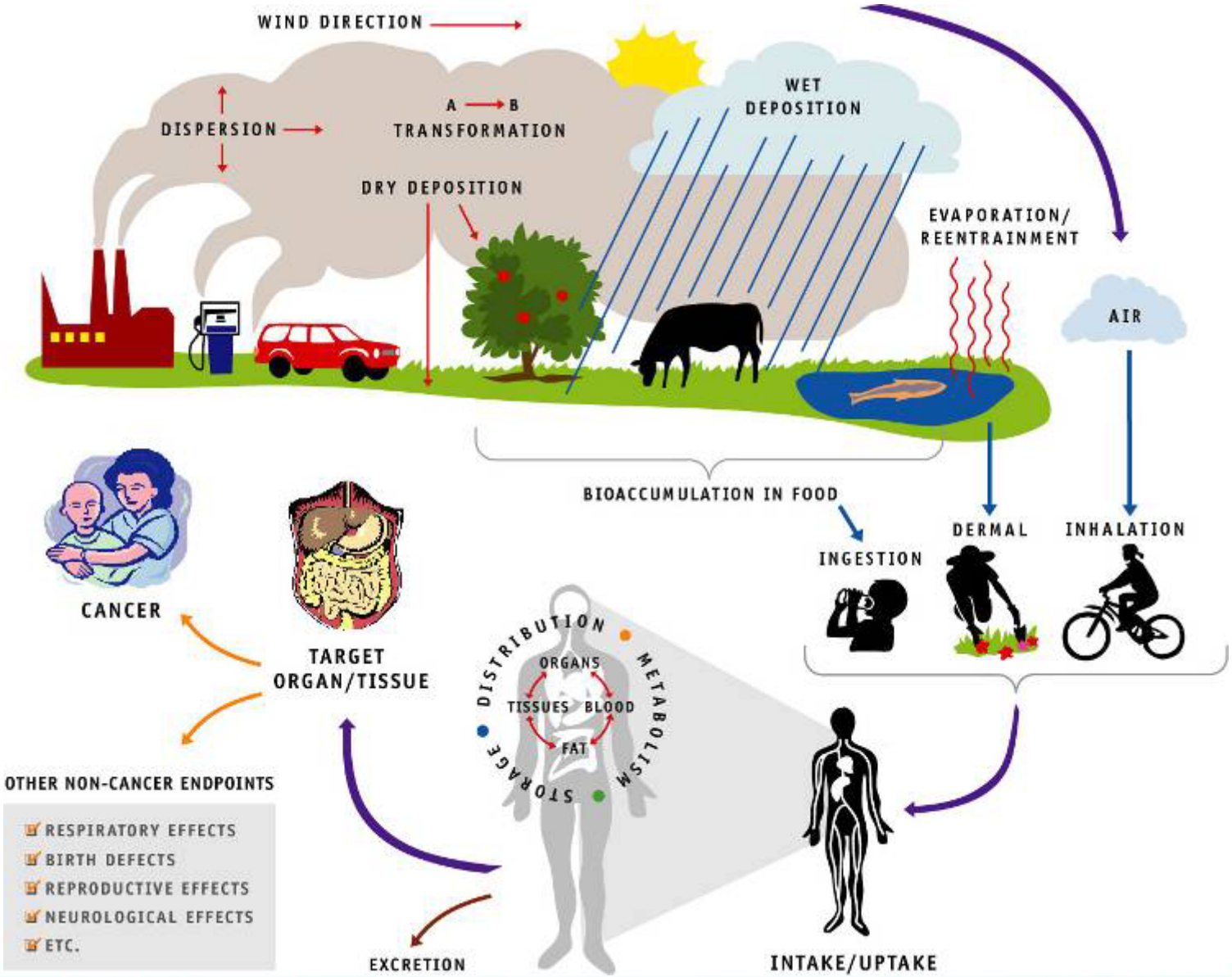
1999 National Emission Inventory (NEI) for HAPs

- **Sum of 188 Emissions (Million tons/yr)**

Major (Point Sources)	1.3
Area (Non Point Sources)	1.6
Mobile Onroad	1.4
Mobile Nonroad	0.8



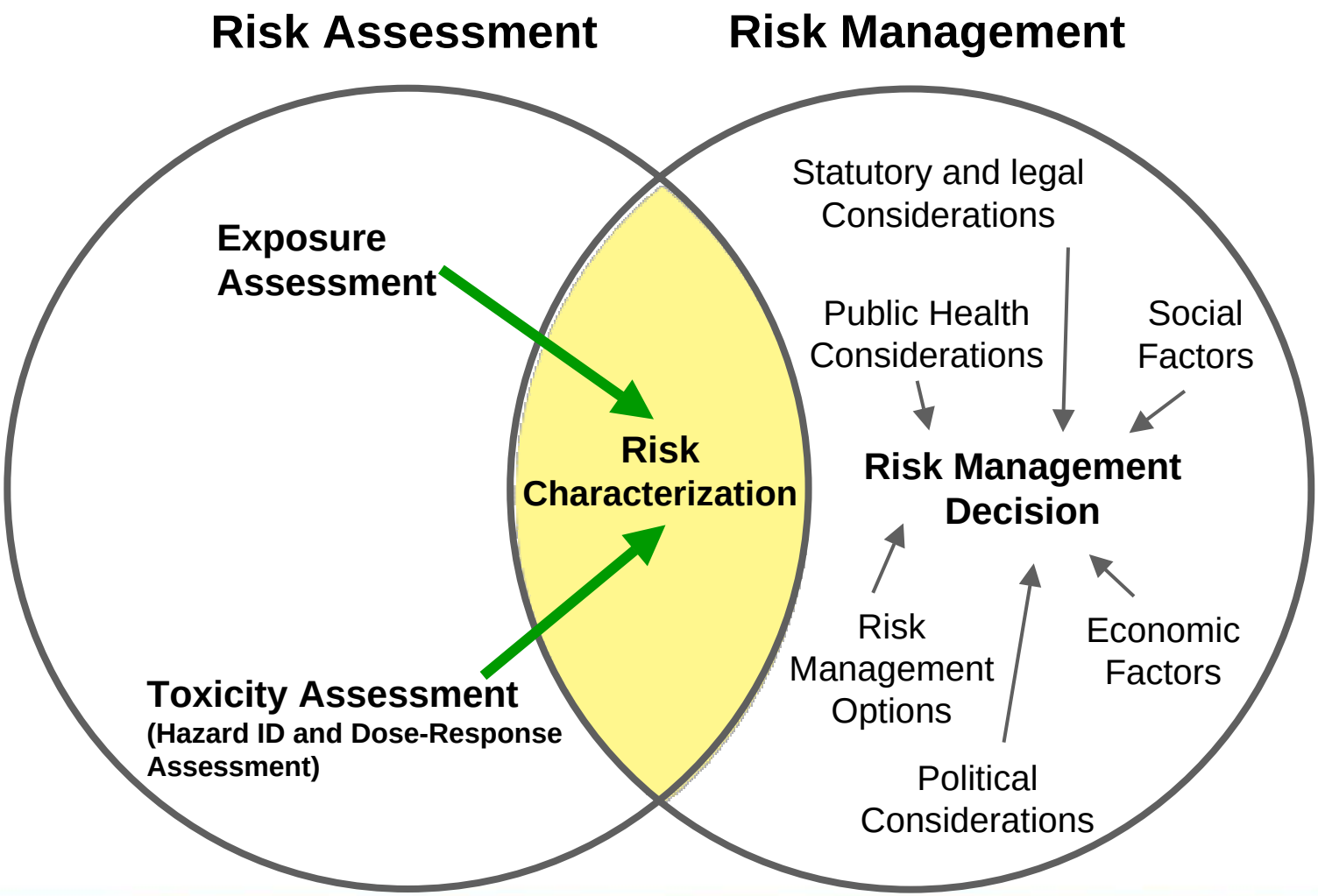
Exposure and Effects from Air Toxics



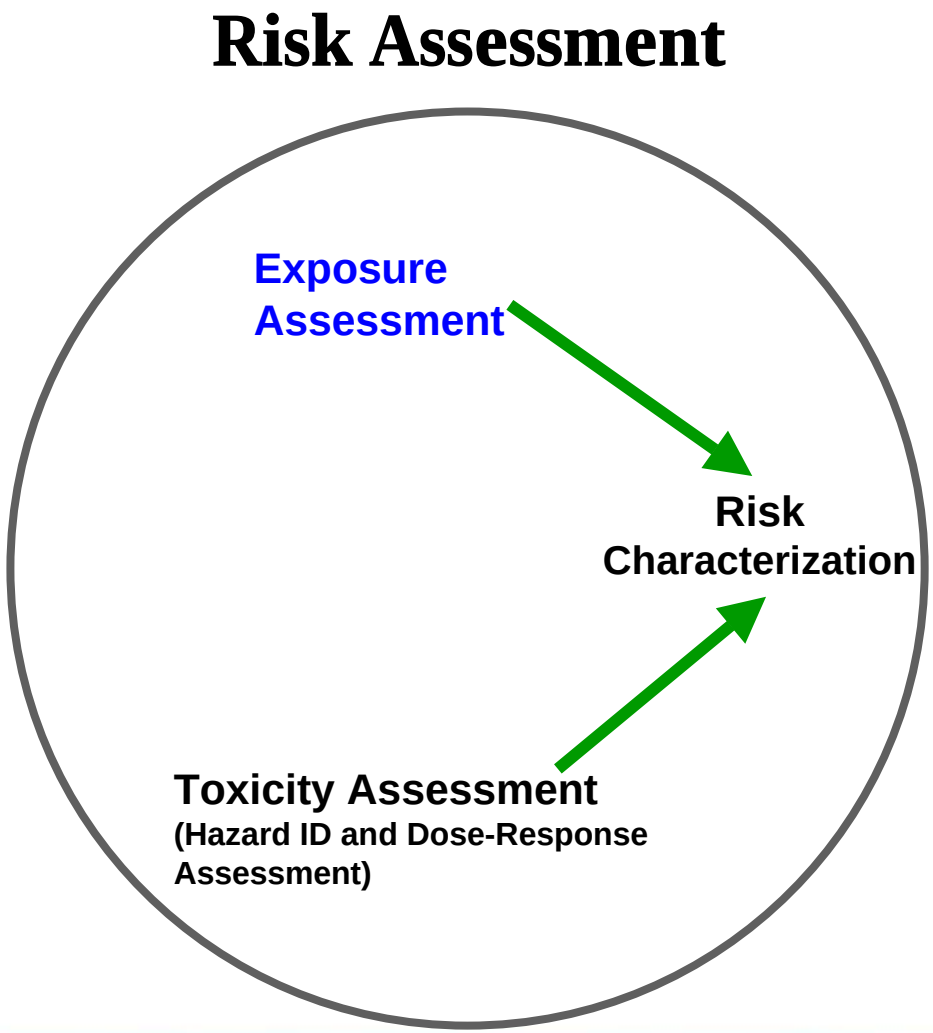
EPA's Program to Manage Air Toxics Risk

- Phase 1: Technology-based MACT standards
  - Completed
- Phase 2: Risk-based standards
  - Residual Risk Standards
  - Urban Air Toxics Program
  - Mobile Source Program
  - Indoor Air

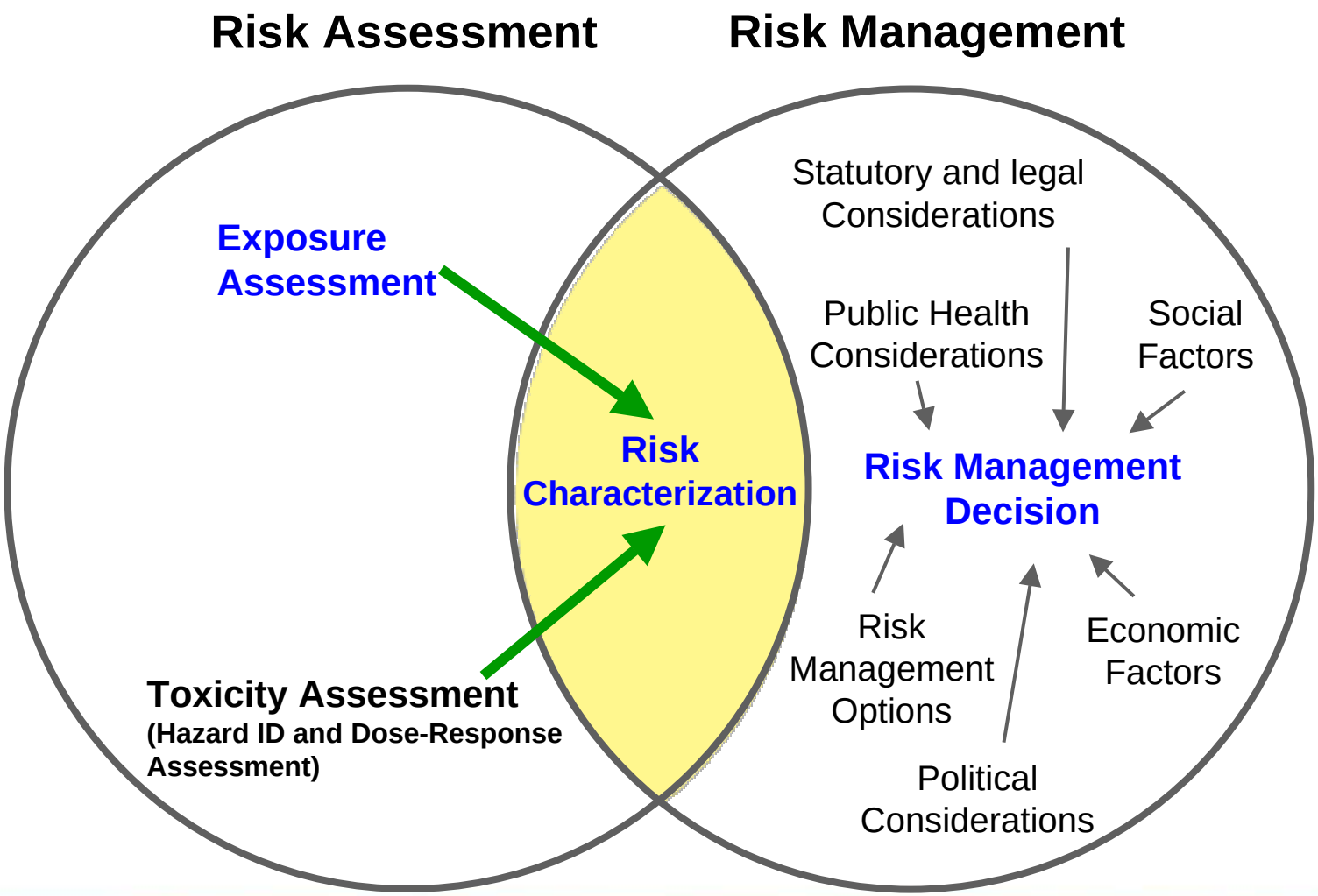
Risk Assessment / Risk Management Paradigm



In Risk Assessment, exposure is the key to Environmental Justice (EJ) concerns



So exposure assessment is central for considering EJ in Risk Management



The National Research Council Agrees

From the 2004 NRC Report on Air Quality Management in the United States:

"The Clean Air Act does not have any programs explicitly aimed at mitigating pollution effects that might be borne disproportionately by minority and low-income communities in densely populated urban areas. Addressing this need will require enhancing the science base for determining exposures of selected communities to air pollution and incorporating environmental equity concepts in the earliest stages of air quality planning."

Risk Management:
Air Toxics vs. Criteria Pollutants

	Criteria Pollutant Program	Air Toxics Program
Approach	Set ambient air concentration standards or National Ambient Air Quality Standards (NAAQS)	Set source-specific emission standards
Pollutants	PM, Ozone, NO2, SO2, CO, Lead	188 HAPs
Measure	Ambient concentrations and number of NAAQS non-attainment areas	Number of source specific standards and amount of emission reductions
Exposure Assessment Issue	How do ambient levels relate to personal exposure?	To what extent do emission reductions result in reduced personal exposures?

EPA's Air Toxics Risk Management Program

- Phase 1: Technology-based MACT standards
  - Completed
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  - Residual Risk Standards
  - Urban Air Toxics Program
  - Mobile Source Program
  - Indoor Air

But, Air Toxics Exposure Assessment is Difficult

- MANY air toxics with many different characteristics
  - Difficult to model and monitor
- A lot of spatial variability
  - Source dominated
  - “Hot Spots”
- Monitoring issues
  - Costs
  - Measurement methods

Comparison of Exposure Assessment Tools

	PRO	CON
Ambient Modeling	- Spatial and temporal coverage - Relatively low cost	- Uncertainty - Surrogate for personal exposure
Ambient Monitoring	-"True" Measure of ambient concentration	- Spatial and temporal gaps - Costly to monitor everywhere - Surrogate for personal exposure
Human Exposure Modeling	- Estimates true human exposure - Relatively low cost	- Uncertainty
Personal Monitoring	- "True" measure of personal exposure	- Spatial and temporal gaps -Very costly to monitoring - Personal inconvenience
The best approach is to utilize a combination of the above.		

Air Toxics Exposure Assessment is Improving

- New ambient monitoring program
- More personal exposure studies
- Enhanced modeling tools
  - Ambient dispersion models
  - Human exposure models
- National Air Toxics Assessments (NATA)

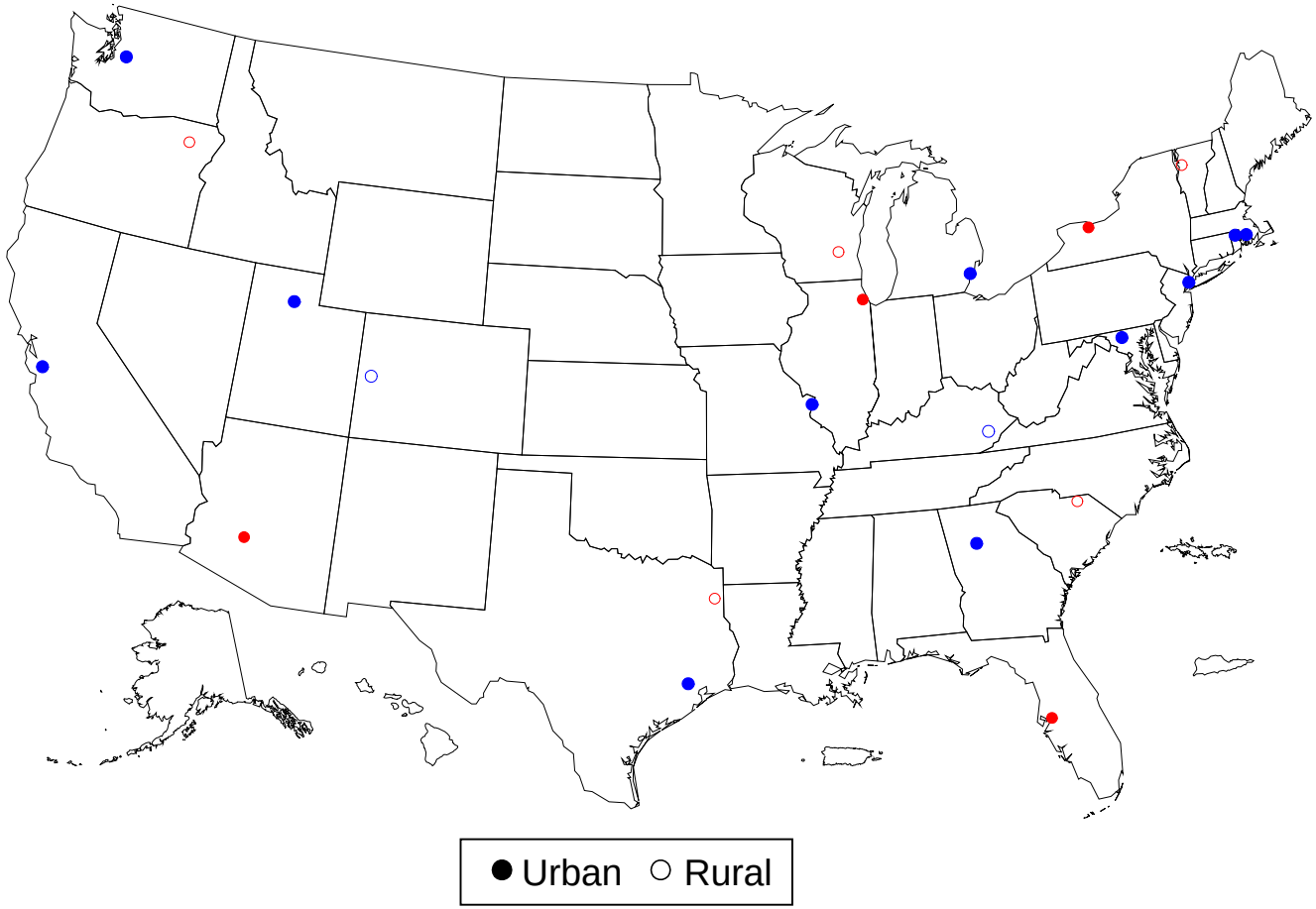
Ambient Air Toxics Monitoring Program

- Newly established program
  - 1999 initial year of funding
  - Pilot city studies conducted in 2000/01
- Two Components in the current air toxics monitoring program
  - National Air Toxics Trends Sites (NATTS)
  - Community Monitoring Projects

NATTS Sites

Jan/03 Startup (13)
Providence RI
Roxbury MA
NY, NY
Washington DC
Decatur (Atlanta), GA
Hazard, KY (Rural)
Detroit, MI
Deer Park (Houston), TX
St. Louis MO
Bountiful UT
Grand Junction, CO (Rural)
San Jose CA
Seattle WA

Jan/04 Startup (9)
Chittenden County, VT **(Rural)**
Rochester, NY
Tampa, FL
Chesterfield, SC **(Rural)**
Chicago, IL
Mayville WI
Harrison County TX **(Rural)**
Phoenix AZ
La Grande, OR **(Rural)**



Community Monitoring Projects

- Objectives
  - Improve spatial characterization of air toxics in urban areas
  - Identify or characterize problem areas
  - Measure progress of emission reduction efforts
  - Air quality modeling evaluation
  - Testing for new monitoring technologies
- First series of community assessment grants recently awarded (April 2004)

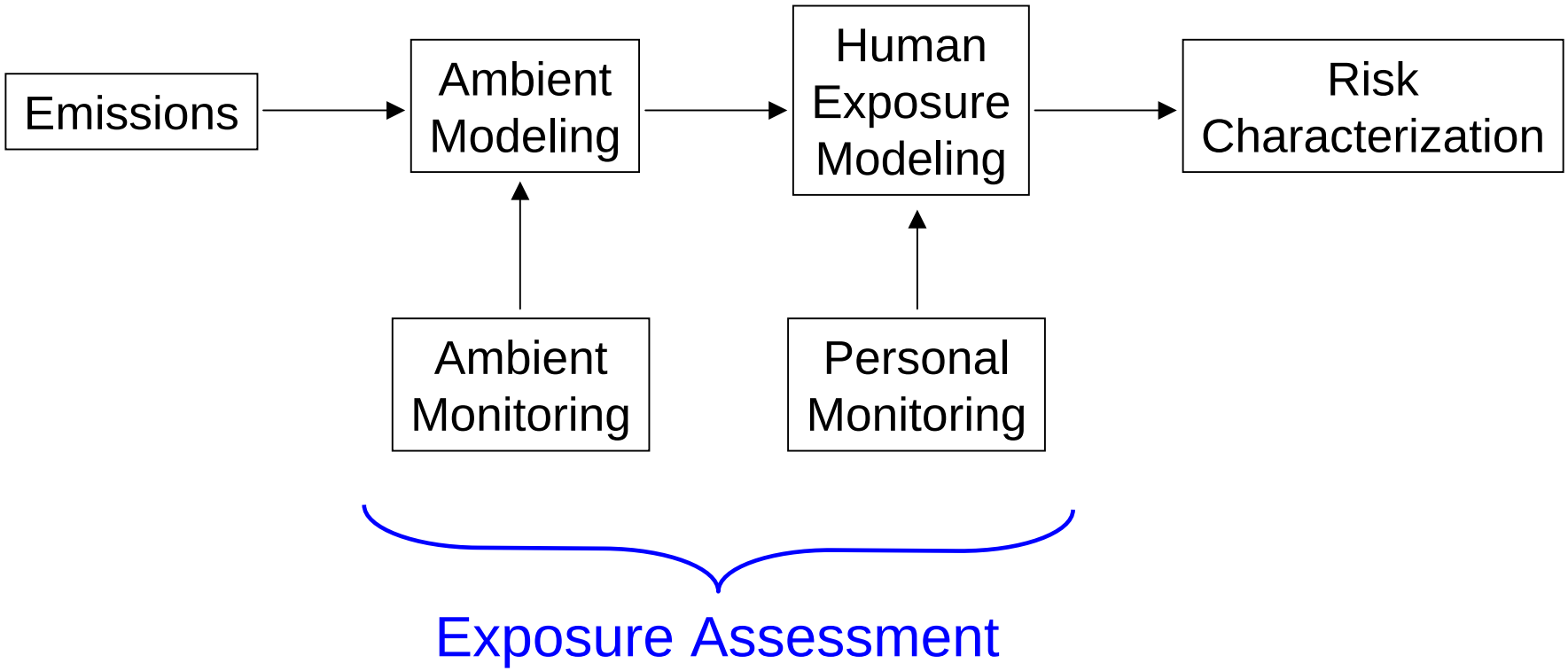
Personal Monitoring Studies

- Goals
  - Understand relationships between ambient levels and personal exposures
  - Characterize exposures in microenvironments
- Currently planned EPA study in Detroit
  - Detroit Aerosol and Exposure Research Study (DEARS)
- Other studies
  - Mickey Leland National Urban Air Toxics Center
  - Health Effects Institute

Enhanced Modeling Tools

- Ambient Dispersion Models
  - AERMOD
  - Community Multiscale Air Quality (CMAQ) model
- Human Exposure Models
  - Air Pollution Exposure (APEX) model
  - Stochastic Human Exposure and Dose Simulation (SHEDS) model
  - Total Risk Integrated Methodology (TRIM) model

National Air Toxics Assessment (NATA)



Summary

- Difficult to assess and manage risks from Air Toxics
  - Shear number of air toxics
  - Diversity of sources
  - Physical and chemical characteristics
- Enhancing air toxics exposure assessment information is central to addressing Environmental Justice concerns
- EPA is making progress towards improving exposure assessment tools and information